

## The systematic position of Colilodionini with description of a new species (Coleoptera, Pselaphidae)

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**The systematic position of Colilodionini with a description of a new species (Coleoptera, Pselaphidae).** - *Colilodion wuesti* sp.n. from West Malaysia is described and a key to species of *Colilodion* is given. The morphological characters of the group are discussed. No convincing synapomorphy is found to link Colilodionini with the Clavigerinae. But, in absence of new evidence, the group is kept in that subfamily.

**Key-words:** Coleoptera - Pselaphidae - *Colilodion* - taxonomy - Malaysia.

### INTRODUCTION

Myrmecophily is wide-spread among Coleoptera and has, in some groups, led to remarkable modifications in the external morphology. Adaptive characters often obscure phylogenetic relationships. This is nicely illustrated by the Oriental pselaphid genus *Colilodion* which comprises four species, each known from a single specimen. Based on a comparative morphological analysis, BESUCHET (1991) concluded that *Colilodion*, is to be placed in the Clavigerinae and established for it the new tribe Colilodionini, even though this group shares some characters with the Pselaphinae.

*Colilodion* exhibits several unusual morphological characters. The most striking features are the head with narrow, dorsally expanded vertex (Figs 1 to 3), the presence of gular and prosternal keels, and the trichomes found on the head and prothorax (Figs 1, 2, 4), in addition to those on elytra and/or abdomen.

On a recent trip with F. Calame (Geneva) to West Malaysia I collected another specimen of *Colilodion* from a sample of forest litter, extracted by Winkler-Moczarski devices (LÖBL, 1992). The specimen, representing a new species which is described below, encourages me to supplement the generic description of BESUCHET (1991) and reanalyse the phylogenetic relationships of this group.

**Colilodion wuesti** sp.n.

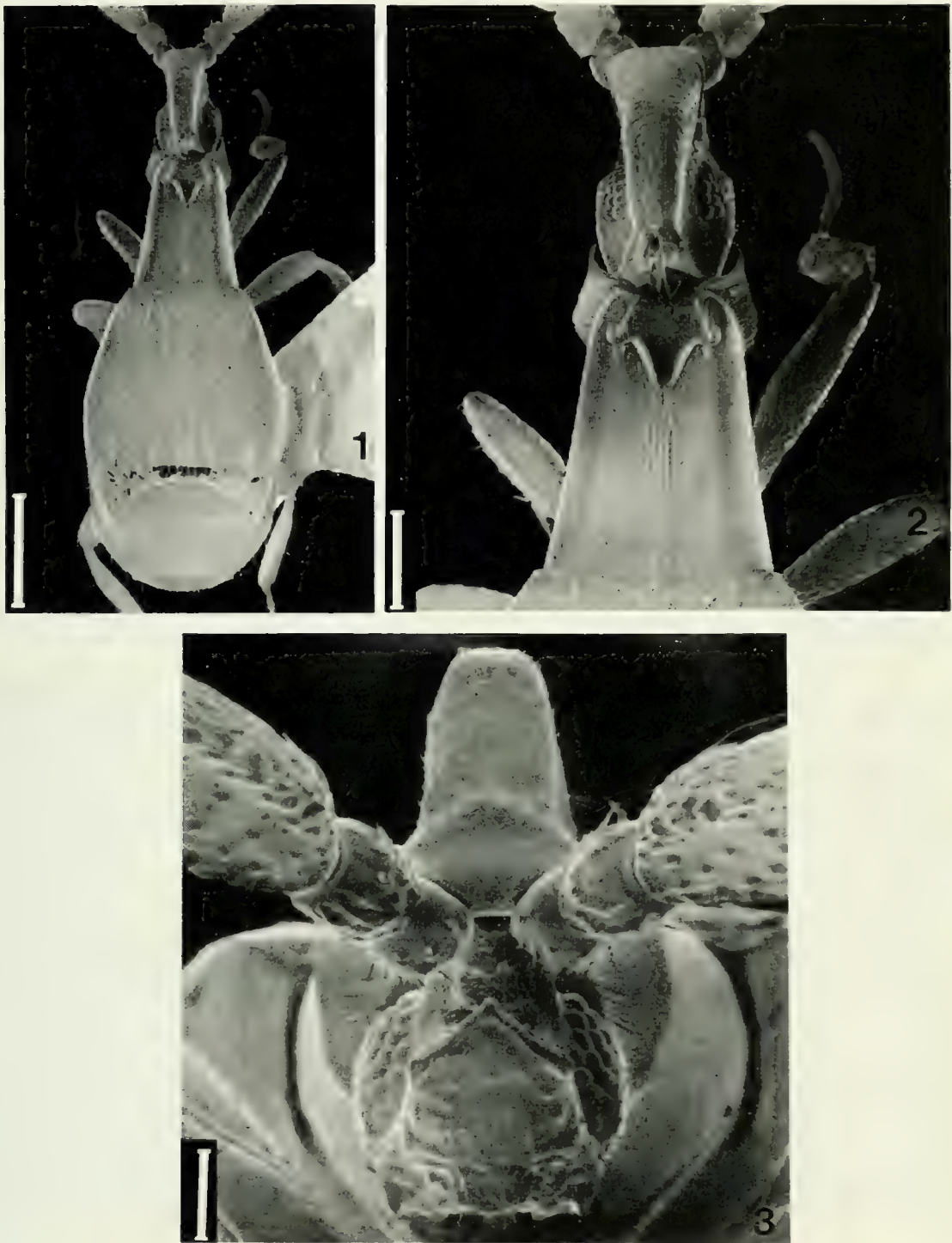
Length 2.27 mm. Body red-brown. Head 0.47 mm long (including trichomes), 0.27 mm wide, 0.60 mm high. Vertex long, strongly raised dorsally, with dorsal surface gradually narrowed apically, dorsal margin convex in lateral view, situated well above level of pronotum; posterior margin vertical, truncate, almost in level with apical pronotal margin, bearing two compact, short trichomes oriented posteriorly and curved ventrally at tip. Lateral surface of vertex vertical. Postero-lateral margin of vertex bearing a long flat trichome oriented laterally and followed ventrally by a very short trichome. Lower posterior portion of vertex strongly narrowed, keel-like. Temporal area concave beyond eye. Eye as in other species. Genal keel absent. Fronto-clypeal disc oblique, flat, raised dorsally, with upper margin triangular (Fig. 3). Frontal notch margined laterally. Punctuation extremely fine, pubescence very short, decumbent. Gular grooves deep, diverging anteriorly. Gular process 0.11 mm high, thickened in middle, with sharp margins, ventral margin almost horizontal, anterior margin vertical in lateral view. Occipital constriction impunctate, shiny, with a small lateral protuberance at each side; at narrowest point 0.05 mm wide in dorsal view and 0.19 mm high.

**A n t e n n a e** with segment 2 cylindrical, somewhat larger than scape, wider than long. Segment 3 large, 0.82 mm long, 0.20 mm wide, subparallel, flattened dorsally, slightly thickened apically, with apical sensilla bearing a bifid flattened seta (Fig. 5).

**P r o n o t u m** 0.55 mm long, 0.46 mm wide, gradually narrowed apically. Median groove evenly narrow, sharply delimited, extending almost to basal pronotal margin. Apical notch deep, trilobed, with median lobe larger than lateral lobes, striate medially. Dorsum margined laterally, extremely finely punctured and with very short pubescence. Lateral pronotal surface shining. Latero-basal lobe distinct. Apico-lateral pronotal margin oblique; upper half of latter bearing a conspicuous flat trichome oriented obliquely upward and forming a point. Center of dorso-apical margin bearing two short trichomes oriented anterad. Lower half of latero-anterior pronotal margin bearing a very short trichome.

**E l y t r a** 0.66 mm long at suture, combined elytral width 0.83 mm. Basal half of elytral disc almost flat, barely alutaceous, apical 2/5 of disc strongly inclined. Lateral margin finely keeled between base and mid-third of lateral length, rounded beyond. Discal striae straight, not extended over inclined apical portion of disc (Fig. 6). Inner stria parallel to suture. Pair of central striae slightly divergent apically. Outer apical angle of elytron extended, bearing a large trichome oriented medio-apically. Punctuation obsolete on inner portion of disc, distinct although very fine on outer portion, consisting of punctures which are much smaller than intervals. Pubescence much longer than that of pronotum, on inner portion of disc longer than on outer portion, semi-erect and arranged in rows with setae alternatively oriented obliquely in and outwardly. Pubescence on inclined apical portion particularly long.

**P r o s t e r n u m** with small oblique process pointed at tip, arising from anterior margin, and large vertical process raising from posterior margin. Median area bearing a



FIGS. 1-3

*Colilodion wuesti* sp.n., habitus, scale bar = 500  $\mu\text{m}$  (1), head and pronotum, scale bar = 200  $\mu\text{m}$  (2), head frontal, scale bar = 100  $\mu\text{m}$  (3). Uncoated.

large trichome. Anterior mesosternal margin strongly raised, pointed in centre. Mesocoxal process covered by a trichome. Metasternum extremely finely punctate, with decumbent, very short pubescence. Anterior metasternal margin moderately raised.

**A b d o m e n** with 1st visible tergite deeply impressed between latero-basal elongate protuberances bearing large trichomes; discal microsculpture absent; apical margin truncate; pubescence consisting mostly of short, recumbent setae, few lateral and apical setae long and erected. Following tergites vertical, in angle with 1st tergite; tergite 2 bearing a row of long, erect apical setae; lateral tubercles distinct. Pubescence and punctuation on abdominal venter as that on metasternum.

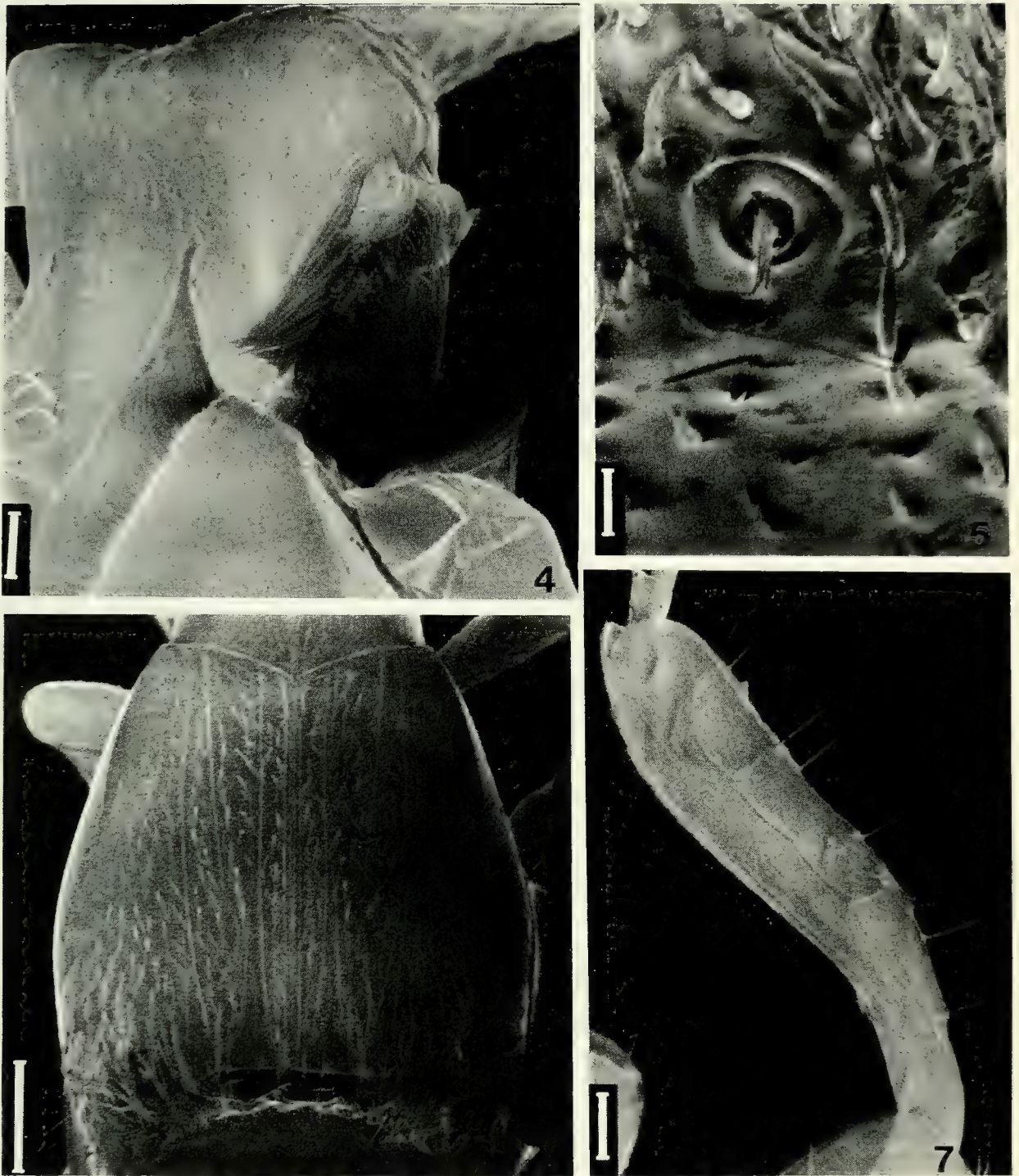
**T i b i a e** distinctly microsculptured, with erect spines (Fig. 7).

**M a t e r i a l**. Holotype, female: West Malaysia, Pahang, Genting Highlands, 1550 m, 5.IV.1993, leg. Löbl & Calame (MHNG).

**B i o l o g y**. The collecting site was a minute remnant of a degraded forest wedged between a road and a construction site. Most of the sifted material was taken around an old, moist stump, but some was also from moist palm leaves lying beneath secondary growth of palms a few meters from the stump. Thus the precise habitat of *Colilodion* remains unknown. It is noteworthy that other congeners were also found in degraded forests. The presence of trichomes and the strongly reduced mouthparts indicate myrmecophily. *Colilodion* and/or its host possibly require more open habitats than generally available in tropical submontane and montane forests and appear to be rare or they occur in rarely explored habitats. The four specimens found by the Geneva team on three of the twelve trips to South East Asia were extracted from hundreds of kg of sifted forest floor litter and represent approximately 0.05% of the pselaphids collected at that time.

**D i s c u s s i o n**. Five species of *Colilodion* are now described. In addition to characters mentioned in the generic description (BESUCHET, 1991) all have the oral orifice oriented ventrally, a fine epipleural stria, an apical antennal sensillum, and a pair of lateral tubercles on the second visible abdominal tergite. Three of the species, *C. inopinatus* Besuchet, *C. mirus* Besuchet and *C. concinnus* Besuchet are each known from a single male, while *C. incredibilis* Besuchet and *C. wuesti* sp.n. are only known from female specimens. Thus, it is difficult to evaluate sexual dimorphism. The antennae do not appear to be sexually modified. In *C. inopinatus* and *C. concinnus* the apical antennal segment is concave dorsally and most of its dorsal surface is occupied by four shallow impunctate impressions (they do not indicate the limits of the primitive segments as has been suggested). In the remaining species, the apical antennomere is subcylindrical or dorsally flattened, without any trace of impunctate impressions, independent of sex. Apart from the genital segments, apparently there are no morphological characters associated with sex. Structures such as the gular and prosternal processes, and the shape of the trichomes provide excellent species characters. The hypothetical function of the gular process as support of the head "rendue fragile..." is unfounded.

*Colilodion wuesti* may be readily distinguished from all members of the genus by the rounded and amarginate postocular area, and by the shape of the upper fronto-clypeal



FIGS 4-7

*Colilodion wuesti* sp.n., cephalic and pronotal trichomes, scale bar = 50  $\mu$ m (4), sensillum on antennal apex, scale bar = 20  $\mu$ m (5), elytra, scale bar = 200  $\mu$ m (6), mesotibia, scale bar = 50  $\mu$ m (7). Uncoated.

margin, which is triangular in the new species but straight or concave in the others. This species resembles *C. mirus* and *C. incredibilis* in the 3rd antennal segment lacking smooth impressions and in the presence of elytral trichomes. It differs from the latter in the dorsally flattened 3rd antennomere, the presence of a prosternal trichome, the shape of the gular and prosternal processes, the shortened marginal keel of the elytron, the fine punctation, and the smaller body size.

#### KEY TO COLILODION SPECIES

- 1 Apical antennal segment with impressed dorsal surface divided into smooth fields. Elytra lacking trichome at latero-apical margins. . . . . 2
- Apical antennal segment subcylindrical or dorsally flattened, without smooth, impressed fields. Elytra with trichome at latero-apical margins. . . . . 3
- 2 Punctation on first visible tergite obsolete, much finer than that of elytra and pronotum. . . . . *C. inopinatus*
- Punctation on first abdominal tergite distinct, similar to that of elytra and pronotum. . . . . *C. concinnus*
- 3 Apical antennal segment flattened dorsally. Marginal keel short, evanescent before reaching mid-length of elytron. . . . . *C. wuesti*
- Apical antennal segment subcylindrical. Marginal keel extended apically beyond mid-length of elytron. . . . . 4
- 4 Apical antennal segment distinctly curved, longer than half of body length. . . . . *C. mirus*
- Apical antennal segment barely curved, shorter than half of body length. . . . . *C. incredibilis*

#### RELATIONSHIPS OF COLILODIONINI

Pselaphids with comparatively elongate mesotrochanters, distant metacoxae and the parameres of asymmetrical aedeagus originating ventrally are currently placed in the division Macroscelia, comprising the Pselaphinae and the Clavigerinae (NEWTON & CHANDLER, 1989; NEWTON & THAYER, 1992). Possibly all Clavigerinae are intergrated myrmecophils. Conspicuous features of the clavigerines are the reduced mouthparts, the reduced number of antennal segments, the presence of trichomes on the elytra and on the base of the abdomen, and the reduced number of visible abdominal tergites. All these characters are considered adaptive and are attributed to association with ants. The group has been placed by some authors outside the Macroscelia as a subfamily (RAFFRAY, 1908) or family (PAULIAN, 1988). Pselaphinae on the other hand are defined by the presence of the primitive states of the characters of the Clavigerinae.

*Colilodion* exhibits characters of both the Clavigerinae and Pselaphinae. BESUCHET analysed 11 character complexes and showed that the more parsimonious

TAB. 1. Distribution of character complexes.

		1	2	3	4	5	6	7	8	9	10	11
1	Pselaphinae	0	0	0	0	0	0	1	0	1	1	0
2	Clavigerinae	0	1	1	1	0	1	0	1	0	1	1
3	Colilodion	1	1	1	1	1	1	1	1	1	1	1

solution is to group *Colilodion* with the Clavigerinae rather than with Pselaphinae. Test of these character complexes results in a tree of 13 steps (Tab. 1) while 18 steps are necessary to produce a tree with *Colilodion* + Pselaphinae as sister group of Clavigerinae. However, many of the characters used are strongly dependent on myrmecophily or are autapomorphies, and one of them is a mis-observation:

**No. 1.** Head with occipital area strongly constricted, vertex narrow and strongly raised, and robust gular process are unique features of *Colilodion*.

**No 2.** Antennae. Reduction of the number of antennal segments is a common feature in pselaphids. In the division Brachyscelia the number varies from 5 to 11, in the Pselaphinae from 7 to 11, and in the Clavigerinae from 3 to 6. *Colilodion* is similar to many Clavigerinae in possessing only 3 antennal segments, but has the basal segment exposed (the latter is exceptionally exposed and large in a few clavigerine genera, e. g. *Apoderiger*, *Neofustiger*). The apex of the large, elongate apical antennal segment in Clavigerinae is truncate, marginate, and usually bears concentric short setae (not so in *Anaclasiger*). These setae are associated with pores. In *Claviger testaceus* the pores are the orifices of glands (CAMMAERTS, 1974). In *Colilodion* the apex of the apical antennal segment bears a sensillar pit with a raised margin and an erect seta. The latter is flat and bifid in *C. wuesti*. This apical sensillum is present in all five species of *Colilodion*, and it is not similar nor homologous (“analogue, sinon homologue...”) with the condition found in all 73 genera of Clavigerinae examined.

**No 3.** Mouthparts. They are small and retracted in *Colilodion* as they are in Clavigerinae. This is an adaptive character associated with the feeding habits. In Staphylinoida it is common that the mouthpart morphology is dependent on trophic behaviour (LESCHEN, 1993). Hence, the reductions found in both groups may be convergent. The oral orifice is oriented apically in Clavigerinae, ventrally in *Colilodion*.

**No 4.** The maxillary palpus is discussed by BESUCHET separately from the other mouthparts (for discussion of number of segments see COULON, 1989). In *Colilodion* the maxillary palpus is small and consists of, as in *Claviger*, a single segment.

**No 5.** The shape of the prothorax in *Colilodion* is unique within the pselaphids.

**No 6.** The size of the trochanters is variable in Macroscelia. Significant is the distance of the basal margin of the mesotrochanter from the coxa. In Clavigerinae the mesotrochanters are perhaps statistically longer in comparison with femora than in Pselaphinae, although they are relatively short in some clavigerine genera (i.e. in *Semiclaviger*). Random measurements have not confirmed BESUCHET's statement of trochanters in Clavigerinae “still longer than those in Pselaphids Macroscelia” (sic). In

*Lasinus* (Pselaphinae, Tyrini), the mesotrochanter is  $3/5$  as long as the mesofemur, in *Cyathiger/Paracyathiger* sp. from Malaysia (Pselaphinae, Cyathigerini) it is less than  $1/3$  the length of the mesofemur whilst in *Claviger testaceus* it is about  $1/2$  as long as the mesofemur.

**No 7.** Clavigerinae have the 1st and 2nd tarsomeres short, the 3rd long, as in the Faronini. In Pselaphinae, as in most other pselaphids, the 2nd tarsomere is long. This character state shows little variation within the subfamilies, and does not appear to be adaptive. In *Colilodion* the 2nd tarsomere is elongate as in Pselaphinae.

**No 8.** The visible abdominal tergum in Clavigerinae is formed by a large plate consisting of the fused tergites 4 to 6, and by two narrow apical tergites (tergites 7 and 8). The base of the visible tergum is depressed. The same condition is found in *Colilodion*. Compared with Pselaphini (BESUCHET, l.c.), which may have a basal depression on the first visible tergite, the Clavigerinae and *Colilodion* exhibit decidedly very distinct abdomina. However, the abdominal tergites are fused in Cyathigerini of the Pselaphinae which do not share any other character with the Clavigerinae. The 3rd abdominal sternite is in *Colilodion* and in Clavigerinae rounded and fully developed as in the Euplectinae and Faroninae, and different from that in the Pselaphinae.

**No 9.** In male *Colilodion*, the 9th abdominal ventrite, the "operculum" is free, as in many Pselaphinae. This condition is not found in the Clavigerinae.

**No 10.** The aedeagi are highly variable in Pselaphidae. In Pselaphinae the parameres are almost always free, in *Colilodion* they are partly fused, and in Clavigerinae completely fused.

**No 11.** Trichomes occur in more groups of myrmecophilous beetles than assumed by BESUCHET. They are present in Pselaphinae: Tyrini (CHANDLER, pers. comm.) and Attapseniini (PARK, 1942), and are well developed in such unrelated superfamilies of beetles as are the Caraboidea, Staphylinoidea, Scarabaeoidea and Dermestoidea. The presence of trichomes indicate ecological rather than phylogenetic relationship. However, it is noteworthy that cephalic and pronotal trichomes are present in *Colilodion*, but absent from Clavigerinae.

## CONCLUSION

The monophyly of the Clavigerinae is supported by the completely fused abdominal tergites 4 to 6, the form of the tarsi and the loss of the 9th sternite. With *Colilodion*, the presence of additional trichomes on the head and prothorax and the position of the mouth are possibly autapomorphous. The form of the antennae in *Colilodion* is suggestive for Clavigerinae, except for the presence of the apical sensillum in the former taxon. However, the anatomy of the antennal apex was investigated in Claviger only. *Colilodion* shares with Clavigerinae the fused abdominal tergites and the fully developed 3rd sternite. The presence of the 9th sternite in male and of the long 2nd tarsomere are primitive and do not necessarily indicate phylogenetic relationship. Awaiting new evidence, the classification of Besuchet is followed.



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